

WHAT IS CLAIMED :

1. A frequency conversion circuit which performs a two-stage frequency conversion of a high frequency input signal, comprising:

a variable frequency filter for removing a high harmonic wave of a first stage local oscillation signal.

2. The frequency conversion circuit as set forth in claim 1, further comprising:

a first stage local oscillation circuit; and  
a mixer circuit,

wherein said variable frequency filter is provided between said first stage local oscillation circuit and said mixer circuit.

3. The frequency conversion circuit as set forth in claim 1, wherein:

said variable frequency filter is a low pass filter.

4. The frequency conversion circuit as set forth in claim 1, wherein:

said variable frequency filter is a band pass filter.

5. The frequency conversion circuit as set forth in claim 1, further comprising:

a control section for controlling frequency characteristic of said variable frequency filter in response to a change in frequency of the local oscillation signal.

6. The frequency conversion circuit as set forth in claim 5, wherein:

said control section controls the frequency characteristic of said variable frequency filter using a phase lock loop.

7. The frequency conversion circuit as set forth in claim 5, wherein:

said control section controls the frequency characteristic of said variable frequency filter by a voltage synthesizer method.

8. A frequency conversion circuit which performs a two-stage frequency conversion of a high frequency input signal, said frequency conversion circuit comprising:

a variable frequency filter whose blocking frequency changes in response to a change in oscillation frequency of the first stage local oscillation signal, for blocking an interference between a high harmonic wave of the first stage oscillation signal and a high harmonic wave of a second stage local oscillation signal.

9. A frequency conversion circuit, which performs a plural-stage frequency conversion of a high frequency input signal, said frequency conversion circuit comprising:

a local oscillation circuit for generating a local oscillation signal of variable frequency;

a mixer circuit corresponding to said local oscillation circuit; and

a variable frequency filter for blocking an interference between a high harmonic wave of the local oscillation signal of variable frequency and a high harmonic wave of a local oscillation circuit from a remaining local oscillation circuit, said variable frequency filter being provided between said local oscillation circuit and said mixer circuit.

10. The frequency conversion circuit as set forth in claim 9, further comprising:

a local amplifier connected in series with said variable frequency filter.

11. The frequency conversion circuit as set forth in claim 9, further comprising:

a local amplifier provided between said local

oscillation circuit and said mixer circuit;

said variable frequency filter provided between said local oscillation circuit and said local amplifier; and

a low pass filter of a fixed frequency provided between said local amplifier and said mixer circuit.

12. The frequency conversion circuit as set forth in claim 9, comprising:

a local amplifier provided between said local oscillation circuit and said mixer circuit;

said variable frequency filter provided between said local amplifier and said mixer circuit; and

a low pass filter of a fixed frequency provided between said local oscillation circuit and said local amplifier.

13. A tuner comprising:

a frequency conversion circuit which performs a two-stage frequency conversion of a high frequency input signal, said frequency conversion circuit comprising:

a variable frequency filter for removing a high harmonic wave of a first stage local oscillation signal.

14. A tuner comprising:

a frequency conversion circuit which performs a

two-stage frequency conversion of a high frequency input signal, said frequency conversion circuit comprising:

a variable frequency filter whose blocking frequency changes in response to a change in oscillation frequency of the first stage local oscillation signal, for blocking an interference between a high harmonic wave of the first stage oscillation signal and a high harmonic wave of a second stage local oscillation signal.

15. A tuner comprising:

a frequency conversion circuit which performs a plural-stage frequency conversion of a high frequency input signal, said frequency conversion circuit, comprising:

a local oscillation circuit for generating a local oscillation signal of variable frequency;

a mixer circuit corresponding to said local oscillation circuit; and

a variable frequency filter for blocking an interference between a high harmonic wave of the local oscillation signal of variable frequency and a high harmonic wave of a local oscillation signal from a remaining local oscillation circuit, said variable frequency filter being provided between said local oscillation circuit and said mixer circuit corresponding to said local

oscillation circuit.

16. A CATV receiving set top box comprising:

a tuner which comprises:

a frequency conversion circuit which performs a two-stage frequency conversion of a high frequency input signal, said frequency conversion circuit comprising:

a variable frequency filter for removing a high harmonic wave of a first stage local oscillation signal.

17. A CATV receiving set top box comprising:

a tuner which comprises:

frequency conversion circuit which performs a two-stage frequency conversion of a high frequency input signal, said frequency conversion circuit comprising:

a variable frequency filter whose blocking frequency changes in response to a change in oscillation frequency of the first stage local oscillation signal, for blocking an interference between a high harmonic wave of the first stage oscillation signal and a high harmonic wave of a second stage local oscillation signal.

18. A CATV receiving set top box comprising:

a tuner which comprises:

a frequency conversion circuit which performs a

plural-stage frequency conversion of a high frequency input signal, said frequency conversion circuit, said frequency conversion circuit comprising:

- a local oscillation circuit for generating a local oscillation signal of variable frequency;

- a mixer circuit corresponding to said local oscillation circuit; and

- a variable frequency filter for blocking an interference between a high harmonic wave of the local oscillation signal of variable frequency and a high harmonic wave of a local oscillation signal from a remaining local oscillation circuit, said variable frequency filter being provided between said local oscillation circuit and said mixer circuit corresponding to said local oscillation circuit.

19. A frequency converter which performs a plural-stage frequency conversion of a high frequency input signal, which includes plural-stage frequency converting sections, each including a local oscillation circuit for generating a local oscillation signal and a mixer circuit for converting a frequency of a signal by mixing the signal with the local oscillation signal, said frequency converter comprising:

- a variable frequency filter which permits a local

oscillation signal to pass therethrough while removing a high harmonic component of the local oscillation signal, said variable frequency filter being provided between said local oscillation circuit for generating local oscillation signals of different frequencies and said mixer circuit.

20. The frequency converter as set forth in claim 19, wherein:

said plural-stage frequency converting sections are two-stage frequency converting sections, wherein said variable frequency filter is provided between the local oscillation circuit and the mixer circuit in the first stage of the frequency converting section.

21. The frequency converter as set forth in claim 19, wherein:

said variable frequency filter is a variable low pass filter.

22. The frequency converter as set forth in claim 19, wherein:

said variable frequency filter is a variable band pass filter.

23. The frequency converter as set forth in claim 19,



further comprising:

a control section for changing frequency characteristics of a variable frequency filter in response to a change in oscillation frequency of said local oscillation circuit.

24. The frequency converter as set forth in claim 23, wherein:

said control section includes a phase lock loop which controls the local oscillation signal generated by said local oscillation circuit and the frequency characteristic of the variable frequency filter in relation to one another based on the oscillation frequency of said local oscillation circuit.

25. The frequency converter as set forth in claim 23, wherein:

said control section adopts the voltage synthesizer method to perform a switch control of the frequency characteristic of the variable frequency filter according to the switch of the oscillation frequency of the local oscillation circuit.

26. The frequency converter as set forth in claim 19, wherein:

a local amplifier is connected in series with said

variable frequency filter between said local oscillation circuit and said mixer circuit.

27. The frequency converter as set forth in claim 19, wherein:

a local amplifier is provided between said local oscillation circuit and said mixer circuit;

said variable frequency filter is provided either between said local oscillation circuit and said local amplifier, or between said local amplifier and said mixer circuit; and

a low pass filter of a fixed frequency is provided either between said local oscillation circuit and said local amplifier or between said local amplifier and the said mixer circuit, where said variable frequency filter is not provided.

28. A frequency converter which performs a plural-stage frequency conversion of a high frequency input signal, which comprises plural-stage frequency converting sections, each including a local oscillation circuit for generating a local oscillation signal and a mixer circuit for converting a frequency of a signal by mixing the signal with the local oscillation signal, said frequency converter further comprising:

a variable frequency filter whose blocking frequency changes in response to a change in oscillation frequency of a first stage local oscillation signal, for blocking an interference between high harmonic waves of different stages.

29. A tuner adopting a frequency converter which performs a plural-stage frequency conversion of a high frequency input signal, said frequency converter comprising plural-stage frequency converting sections, each including a local oscillation circuit for generating a local oscillation signal and a mixer circuit for converting a frequency of a signal by mixing the signal with the local oscillation signal, said frequency converter further comprising:

a variable frequency filter which permits a local oscillation signal to pass therethrough while removing a high harmonic component of the local oscillation signal, said variable frequency filter being provided between said local oscillation circuit for generating local oscillation signals of different frequencies and said mixer circuit.

30. A tuner adopting a frequency converter which performs a plural-stage frequency conversion of a high frequency input signal, said frequency converter

comprising plural-stage frequency converting sections, each including a local oscillation circuit for generating a local oscillation signal and a mixer circuit for converting a frequency of a signal by mixing the signal with the local oscillation signal, said frequency converter further comprising:

a variable frequency filter whose blocking frequency changes in response to a change in oscillation frequency of a first stage local oscillation signal, for blocking an interference between high harmonic waves of different stages.

31. A CATV receiving set top box comprising a tuner adopting a frequency converter which performs a plural-stage frequency conversion of a high frequency input signal, said frequency converter comprising plural-stage frequency converting sections, each including a local oscillation circuit for generating a local oscillation signal and a mixer circuit for converting a frequency of a signal by mixing the signal with the local oscillation signal, said frequency converter further comprising:

a variable frequency filter which permits a local oscillation signal to pass therethrough while removing a high harmonic component of the local oscillation signal, said variable frequency filter being provided between said

local oscillation circuit for generating local oscillation signals of different frequencies and said mixer circuit.

32. A CATV receiving set top box comprising a tuner adopting a frequency converter which performs a plural-stage frequency conversion of a high frequency input signal, said frequency converter comprising plural-stage frequency converting sections, each including a local oscillation circuit for generating a local oscillation signal and a mixer circuit for converting a frequency of a signal by mixing the signal with the local oscillation signal, said frequency converter further comprising:

a variable frequency filter whose blocking frequency changes in response to a change in oscillation frequency of a first stage local oscillation signal, for blocking an interference between high harmonic waves of different stages.